

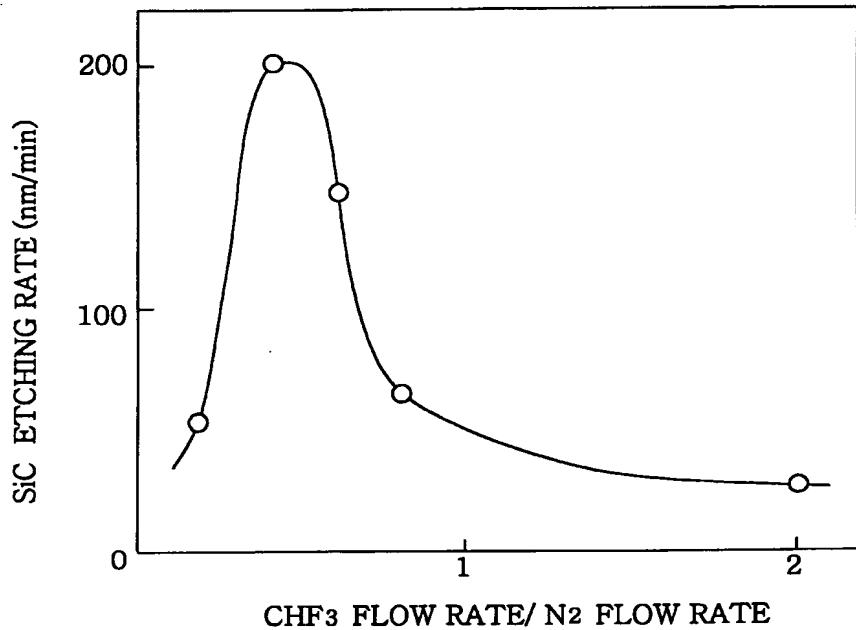
REMARKS/ARGUMENTS

Applicants thank Examiner Chen for the helpful and courteous discussion of November 1, 2005, during which it was pointed out that certain flow rate ratios of $\text{CHF}_3:\text{N}_2$ gas can provide substantially improved etching ratios as shown in Figure 3.

Independent Claims 1 and 18 are amended to state that the ratio of flow rates of CHF_3 and N_2 gases is from about 0.4 to about 06.

Applicants draw the Office's attention to Figure 3 of the present specification, reproduced below for convenience:

FIG.3



As is seen in Figure 3 above, the SiC etching rate does not vary linearly with the $\text{CHF}_3:\text{N}_2$ flow rate ratio. Within a certain region of flow rate ratio, the SiC etching rate is dramatically higher than the SiC etching rate achieved at other $\text{CHF}_3:\text{N}_2$ flow rate ratios.

The Office rejected dependent Claims 6 and 7 over Nishizawa (U.S. 6,617,244) in combination with one or more of Li (U.S. 6,670,278); Nemani (U.S. 6,764,958); Chooi (U.S. 6,284,657); and Demmin (U.S. 6,635,185). In the first three full paragraphs on page 10 of the Amendment filed in the present case on August 17, 2005, Applicants argued that the subject matter of dependent Claims 6-7, 9-11 and 15-16 is patentable over the prior art (including Nishizawa) because significantly superior etching performance is seen in the domains of CHF₃/N₂ gas flow ratios recited in, for example, Claims 6 and 7. The arguments of the Amendment of August 17 directed the Examiner's attention to page 13 of the specification and Fig. 3 of the present specification and Fig. 3 of Nishizawa. Applicants submit that the subject matter of at least Claims 6 and 7 is patentable over the cited prior art because the prior art does not suggest or disclose that the SiC etch rate can be dramatically increased within a certain range of CHF₃/N₂ flow rate ratios.

During the discussion of November 1, 2005, the Examiner pointed to column 6, lines 43-52 as support for the obviousness rejection. In the opinion of the Examiner this disclosure of Nishizawa indicates that there is a relationship between increasing SiC etching rate and the introduction of N₂ into the prior art process. Applicants draw the Office's attention to Figure 3 of the prior art, reproduced below for convenience:

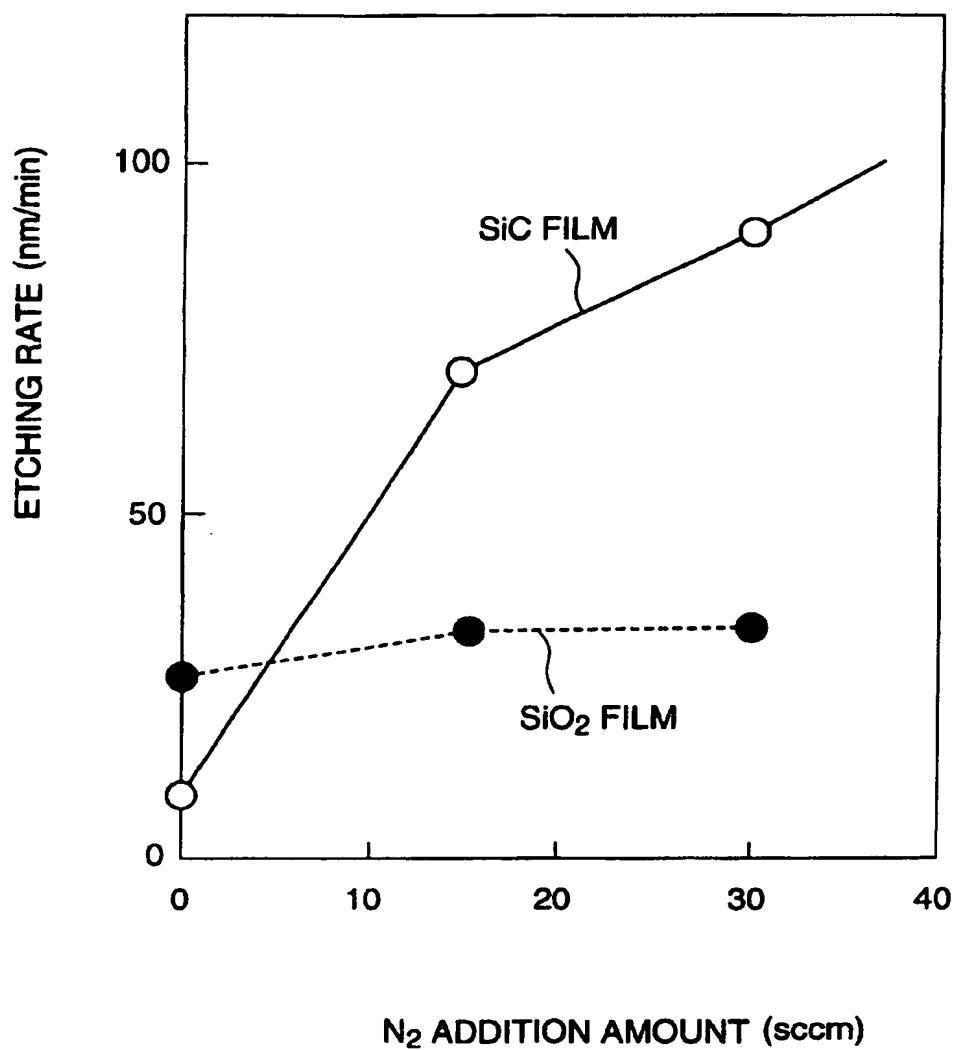


FIG.3

As is seen above, Figure 3 of Nishizawa correlates the etching rate of both a SiC film and a SiO₂ film as a function of N₂ the addition amount. Applicants submit that the data provided in Figure 3 of Nishizawa does not suggest the dramatically improved SiC etching rate achieved when the CHF₃/N₂ etch flow rate ratio is between about 0.4 and about 0.6 as claimed in present Claims 1 and 18. Applicants submit that those of ordinary skill in the art, looking at Figure 3 of Nishizawa, would not foresee the dramatically increased SiC etching rate observed at a gas flow ratio range of from about 0.4 to about 0.6 as recited in Claims 1 and 18. In fact, Figure 3 of Nishizawa appears to indicate that the etching rate is linearly related to the N₂ addition amount.

Applicants have shown in Figure 3 of the present specification that the claimed invention provides a dramatically improved SiC etching rate within certain flow rate ratios and that the relationship is not merely linear. Applicants therefore submit that the about 0.4 to about 0.6 gas flow rate ratio recited in present Claim 1 is not merely an optimization of the gas flows.

Applicants draw the Office's attention to new dependent Claims 30-35. The new dependent claims require that the SiC etching rate is at least 100 nm/min, 150 nm/min or from 150 to 200 nm/min, respectively. Thus, the effect achieved at the CHF₃/N₂ flow rate ratio recited in present Claims 1 and 18 is claimed in new dependent Claims 30-35.

Applicants submit that the data of the specification, including Figure 3, demonstrate that significantly superior SiC performance may be realized when the CHF₃/N₂ flow rate ratio is between about 0.4 to about 0.6. Applicants further submit that Nishizawa does not suggest or disclose that aforementioned SiC etch rates can be achieved within a certain flow rate ratio range. Applicants therefore submit that present Figure 3 and the examples of the specification are sufficient to rebut the assertion *of prima facie* obviousness forwarded by the Office.

Applicants submit that amended independent Claims 1 and 18 are not obvious in view of the prior art and respectfully request withdrawal of the rejection.

Independent Claim 18 stands rejected as obvious in view of Nishizawa (U.S. 6,617,244). The basis for the rejection of independent Claim 18 in view of Nishizawa is partially described on page 3 of the Office Action as follows:

Nishizawa teaches that in the case of the fluorine compound, when an excess amount of organic polymer is not generated in etching, the mixture of the oxygen gas is not required (col. 6, lines 65-67). Nishizawa discloses that the fluorine compound may be fluorocarbon such as CHF₃ (col. 3, lines 38-42).

For convenience, the disclosure at column 6, lines 57-67 of Nishizawa is reproduced below:

In addition, even if nitrogen gas is added to a gas of a fluorine compound such as NF₃ or SF₆, the above described etching rate effect occurs. In the case of a fluorine compound gas, a mixture of an O₂ gas is not required because a gas mixture of this oxygen gas increases the amount of fluorine radical in the above plasma excitation, and a substantial amount of the fluorine radical can be formed by using the gas of the fluorine compound, such as NF₃ or SF₆. Also, in the case of the fluorine compound gas, since an excess amount of organic polymer is not generated in etching, the mixture of the O₂ gas is not required.

Applicants submit that the disclosure at column 6, lines 57-67 is specific to the use of fluorine compounds NF₃ or SF₆. Applicants submit that the above-cited disclosure is restrictive to the named species and does not include the entire genus of fluorine compounds disclosed at column 3, lines 38-40. In two places of the above-cited disclosure of Nishizawa it is explicitly stated that the fluorine compound is one “such as NF₃ or SF₆”. Thus the species NF₃ and SF₆ are described in the alternate and the disclosure at column 6, lines 57-65 is restricted to the members of the group.

As support for this interpretation of the disclosure of Nishizawa, Applicants submit herewith a dictionary definition for the term “such”. As described in “Black’s Law

Dictionary," 8th Edition, B. Garner, Thomson (copy attached herewith) the word "such" is an adjective that is used to identify a particular kind or a particular item.

At lines 57-67 of column 6 of Nishizawa it is stated that an O₂ gas is not required because an excess amount of organic polymer is not generated during etching. Applicants submit that this disclosure indicates that only inorganic fluorine compounds are intended for use in the absence of an O₂ gas. Because compounds such as NF₃ or SF₆ are inorganic materials it is impossible for them to form an organic polymer during etching. Thus the description at column 6, lines 66-67 that an O₂ gas is not required when organic polymer is not generated is further evidence that it is Nishizawa's intent to exclude fluorocarbon materials.

Applicants thus submit that the disclosure of Nishizawa, cited by the Office in rejecting present Claim 18 as obvious does not suggest the use of a fluorocarbon material when oxygen is not present, when this disclosure is interpreted within the meaning of the entire paragraph at column 6, lines 57-67.

Applicants respectfully request withdrawal of the rejection and allowance of all now-pending claims.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Steven P. Wehrrouch
Attorney of Record
Registration No. 32,829

Stefan U. Koschmieder, Ph.D.
Registration No. 50,238

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)
SUK/rac